

WHAT IS CLAIMED IS:

1. A method for treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

providing a tension member having a first end and a second end, each of said ends provided with an anchor member; and

positioning said tension member transverse to said chamber to reduce the radius of curvature of a wall of the chamber that includes the infarcted tissue.

2. The method of claim 1, further comprising the step of positioning said anchor members exterior to the chamber.

3. The method of claim 1, wherein the positioning step includes positioning said tension member diametrically across the infarcted tissue.

4. The method of claim 2, wherein said heart chamber comprises healthy tissue adjacent said infarcted tissue and each of said anchor members are positioned exterior to the heart chamber approximately between said healthy and infarcted tissue.

5. The method of claim 2, wherein one of said anchors is positioned on a septum wall of the heart.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000

5  
6. The method of claim 2, wherein one of said anchors is positioned on the infarcted tissue.

6  
7. The method of claim 2, wherein said infarcted tissue is located in a region of a left ventricle of the heart proximal a mitral valve and said tension member draws papillary muscles of the mitral valve together.

7  
8. The method of claim 7, wherein said tension member is curved between said anchor members.

9  
9. The method of claim 1, wherein the providing and positioning steps include providing and positioning a plurality of tension members.

9  
10. A method for treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

positioning a tension member having a first end and a second end, each of said ends provided with an anchor member; and

5 positioning said tension member transverse to said chamber to draw walls containing the infarcted tissue together.

10  
11. The method of claim 10, further comprising the step of positioning said anchor members exterior to the chamber.

14

9

12.

The method of claim 10, wherein the positioning step includes positioning said tension member diametrically across the infarcted tissue.

11

10

13.

The method of claim 11, wherein said heart chamber comprises healthy tissue adjacent said infarcted tissue and each of said anchor members are positioned exterior to the heart chamber approximately between said healthy and infarcted tissue.

12

10

14.

The method of claim 11, wherein one of said anchors is positioned on a septum wall of the heart.

13

10

15.

The method of claim 11, wherein one of said anchors is positioned on the infarcted tissue.

14

10

16.

The method of claim 11, wherein said infarcted tissue is located in a basal region of a left ventricle of the heart proximal a mitral valve and said tension member draws papillary muscles of the mitral valve together.

15

14

17.

The method of claim 10, wherein said tension member is curved between said anchor members.

18

The method of claim 10, wherein the providing and positioning steps

include providing and positioning a plurality of tension members.

<sup>17</sup>  
19. A method of treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

providing a tension member having a first end and a second end, each of said ends provided with an anchor member;

5 positioning one of said anchor members on an outer wall of the infarcted tissue; and

positioning said tension member through the heart chamber such that the infarcted tissue is drawn toward an interior of the heart chamber.

<sup>18</sup> <sup>17</sup>  
20. The method of claim 19, wherein positioning said anchor member includes positioning said anchor member substantially at a center of the infarcted tissue.

<sup>19</sup> <sup>17</sup>  
21. The method of claim 19, further comprising the step of positioning the other of said anchor members on an outer wall of the heart chamber located approximately opposite to the infarcted tissue, with the tension member extending transverse to the chamber between said anchor members.

<sup>20</sup>  
22. A method of treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N.W.  
WASHINGTON, D.C. 20005  
202-408-4000

removing the infarcted tissue;  
suturing the chamber wall separated as a result of said removing step;  
providing a tension member having a first end and a second end, each of  
said ends provided with an anchor member; and  
positioning said tension member transverse to said chamber to reduce a  
radius of curvature of the chamber wall proximal to the suturing.

21  
23. The method of claim 20, wherein the infarcted tissue includes a first  
region having infarcted tissue that extends through an entire wall thickness of the  
heart chamber and a second region, adjacent said first region, having infarcted  
tissue that does not extend through the entire wall thickness, and said removing  
step includes removing the infarcted tissue from the second region so that a thin  
wall region of the heart chamber remains, and said positioning step includes  
positioning said tension member transverse the thin wall region.

22  
24. The method of claim 21, wherein said heart chamber comprises  
regions of thick walls adjacent said thin wall region and said anchor members are  
positioned on the outer wall of the heart approximately between said thick wall  
regions and said thin wall regions.

25. A method for treating a heart having a zone of infarcted tissue in a  
chamber thereof, comprising the steps of:

providing a compression member having a first end and a second end,  
each of said ends provided with an anchor member; and

positioning said compression member around an exterior of a heart wall  
surrounding said chamber to reduce the radius of curvature of a portion of the  
heart wall that includes the infarcted tissue.

26. The method of claim 25, wherein said compression member includes  
a clamp.

27. A method of treating a heart having a zone of infarcted tissue in a  
chamber thereof, comprising the steps of:

providing a suture having two free ends;

suturing said suture substantially around an epicardial perimeter of the  
infarcted tissue;

pulling said two free ends to draw said infarcted tissue together  
substantially toward a center of the infarcted tissue.

28. The method of claim 27, further comprising the step of securing the  
suture to hold the drawn together infarcted tissue in place.

29. The method of claim 28, wherein the securing step includes tying the  
free ends of the suture.

30. The method of claim 27, wherein the step of drawing the infarcted tissue together includes decreasing a perimeter of the infarcted tissue.

31. The method of claim 27, wherein the sutures are pulled in so that outer perimeter walls of the infarcted tissue contact each other.

32. The method of claim 27, further comprising the step of placing a patch over said infarcted tissue after said pulling step.

33. The method of claim 27, further comprising the steps of providing an enclosure member and suturing said enclosure member around a perimeter of the drawn together infarcted tissue.

34. The method of claim 33, wherein said enclosure member has a perimeter not greater than the perimeter of the drawn together infarcted tissue.

35. The method of claim 33, wherein said enclosure member is made of rigid material.

36. The method of claim 35, wherein said enclosure member is comprised substantially of stainless steel.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000

37. The method of claim 33, wherein said enclosure member is made of a semi-rigid material.

38. The method of claim 33, wherein said enclosure member is a ring.

39. A method of treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

providing an enclosure member having a first configuration and a second configuration,

positioning said enclosure member around said infarcted tissue zone, wherein said enclosure member is in the first configuration during said positioning; and

securing said enclosure member onto a wall of the heart after said positioning step, wherein said enclosure member reconfigures to the second configuration after said securing step to reduce a radius of curvature of a portion of the heart wall that includes the infarcted tissue.

40. The method of claim 39, wherein said enclosure member is made of a shape memory material having a transformation temperature, said enclosure member has the first configuration below the transformation temperature and the second configuration above the transformation temperature.

5  
10

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000



41. The method of claim 39, wherein said enclosure member is made of a spring metal processed such that the enclosure member has the first configuration when said enclosure member is subject to external forces and has the second configuration when said enclosure member is subject to no external forces.

<sup>23</sup>  
~~42~~. A method for treating a heart having a zone of infarcted tissue in a chamber thereof, comprising the steps of:

deforming a wall of the chamber that includes the infarcted tissue such that a radius of curvature of the wall is reduced.

<sup>24</sup> <sup>23</sup>  
~~43~~. The method of claim ~~42~~<sup>23</sup>, wherein deforming the wall also reduces the radius of curvature of the wall in non-infarcted tissue zones located adjacent to the infarcted zones.

<sup>25</sup> <sup>23</sup>  
~~44~~. The method of claim ~~42~~<sup>23</sup>, wherein deforming the wall includes positioning a splint with respect to the heart chamber.

45. An apparatus for treating a heart having a zone of infarcted tissue in a chamber thereof, comprising:  
a patch adapted to be attached to a wall of the heart; and  
at least one elongated member secured to the patch.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N.W.  
WASHINGTON, D.C. 20005  
202-408-4000

46. The apparatus of claim 45, wherein said elongated member is substantially rigid.

47. The apparatus of claim 45, wherein said at least one elongated member includes a first end secured to said patch and a second end adapted to contact a region of said infarcted tissue when said patch is placed over said infarcted region.

48. The apparatus of claim 47, wherein, when said patch is placed over said infarcted region, said elongated member pushes said infarcted tissue into an interior of said heart chamber.

49. The apparatus of claim 47, wherein said at least one elongated rigid member is made of Dacron or PTFE.

50. The apparatus of claim 47, wherein said at least one elongated member is secured in a perpendicular direction to said patch.

51. The apparatus of claim 47, wherein said at least one elongated member is secured to said patch at an angle.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000



58. The apparatus of claim 55, wherein said enclosure member is comprised substantially of stainless steel.

59. The apparatus of claim 55, wherein said enclosure member is a ring-shaped.

60. The apparatus of claim 55, wherein said second ends of said sutures are attached to points on said chamber wall located at substantially the same points that the first ends are attached.

61. The apparatus of claim 60, wherein said plurality of sutures each have a length less than twice a distance from the point of attachment of the first end of said suture to said enclosure member measured before said tissue has been drawn through said enclosure member.

62. The apparatus of claim 61, wherein said lengths of said plurality of sutures are non-uniform.

63. The apparatus of claim 55, wherein said plurality of sutures each have different lengths.

64. A method of treating a heart having a zone of infarcted tissue in a

chamber thereof, comprising:

providing a plurality of sutures having first and second ends;

attaching said first ends to points on a wall of said chamber proximate said infarcted tissue;

positioning an enclosure member substantially over said infarcted tissue;

extending said plurality of sutures through said enclosure member; and

attaching said second ends to a wall of said chamber to draw the infarcted tissue through said enclosure member.

65. The method of claim 64, wherein said enclosure member has a perimeter not greater than a perimeter of said infarcted tissue before the infarcted tissue is drawn together.

66. The method of claim 64, wherein said enclosure member is made of a rigid material.

67. The method of claim 64, wherein said enclosure member is made of a semi-rigid material.

68. The method of claim 64, wherein said enclosure member is made substantially of stainless steel.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N.W.  
WASHINGTON, D.C. 20005  
202-408-4000

69. The method of claim 64, wherein said enclosure member is ring-shaped.

70. The method of claim 64, wherein said attaching step includes attaching said second ends of said sutures to the chamber wall at substantially the same points that the first ends are attached.

71. The method of claim 70, wherein said plurality of sutures each have lengths not greater than twice a distance from the point of attachment of the first end of said suture to said enclosure member before said tissue is drawn through said enclosure member.

72. The method of claim 71, wherein said lengths of said plurality of sutures are non-uniform such that during said drawing step, said tissue is drawn in non-uniformly.

73. The method of claim 64, wherein said plurality of sutures each have different lengths to draw said tissue in non-uniformly.

74. An apparatus for treating a heart having a zone of infarcted tissue in a chamber thereof, comprising:

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000

an enclosure member adapted to assume a first configuration during placement of said enclosure member around said infarcted tissue zone, and adapted to assume a second configuration after securing said enclosure member to a heart wall of said chamber to draw said infarcted tissue toward a center of the enclosure member and reduce a radius of curvature of the heart wall.

5

75. The apparatus of claim 74, wherein said enclosure member includes a lumen through which a cord having a first end and a second end is inserted, said ends of said cord extending outside said enclosure member.

76. The apparatus of claim 74, wherein said enclosure member is made of a shape memory material having a transformation temperature, said enclosure member having said first configuration below said transformation temperature and said second configuration above said transformation temperature.

77. The apparatus of claim 74, wherein said enclosure member is made of a spring metal processed such that the enclosure member has the first configuration when said enclosure member is subject to external forces and has the second configuration when the enclosure member is subject to no external forces.

5

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, D. C. 20005  
202-408-4000